REMARKS

This paper is in response to the Official Action mailed November 6, 2008.

The claims are amended to adopt Examiner suggestions and clarify the claim language.

The word "derived" is removed from claims 8-11.

Claim 18 is amended to specify that the encoded sequence has the activity of "a glutoredoxin." Support is found at page 19, lines 1-6. This is believed to remove any "new matter" issue with respect to claim 18.

Applicants request that the double patenting rejection be held in abeyance until such time as otherwise allowable subject matter is indicated.

All claims were rejected under 35 U.S.C. 103 on the basis that the claimed subject matter would have been obvious at the time the invention was made. Applicants request reconsideration of the rejections based on the remarks which follow.

In essence, the rejection is unfounded since the cited prior art does not provide a reasonable basis for the skilled artisan to have expected that overexpression of a Grx2 would confer a plant with increased tolerance to environmental stress. For that reason, the teaching of the references would not have made obvious the claimed subject matter.

Applicants provide the following more detailed commentary as to the specific prior art references relied upon in the rejections.

The primary reference to Lanahan teaches the expression of transgenic thioredoxin in plants for the purpose of achieving enhanced protein/starch recovery. As recognized in the Official Action, the nucleic acids recited in the present claims are not disclosed. In addition, and importantly, Lanahan does not teach transgenic plants with an increased tolerance to an environmental stress associated with any of salinity, drought, or low temperature.

The Gan reference is cited as disclosing SEQ ID NO: 3 and SEQ ID NO: 4. The reference contains no suggestion to produce transgenic plants with an increased tolerance to an environmental stress associated with any of salinity, drought, or low temperature.

Grant is cited as teaching that "glutoredoxins play an important role in protecting a cell exposed to environmental stresses" and that its expression is up-regulated by certain stresses. Official Action, page 5. Applicants respectfully note that Grant discloses only differential regulation of glutaredoxin gene expression in response to stress conditions in yeast. It describes that the expression of two yeast glutaredoxin genes (GRX1 and GRX2) is induced in response to various stress conditions and are activated or negatively regulated in different pathways *via* stress-responsive STRE elements in the promoter region. Based on the differential expression patterns, Grant concludes that the two glutaredoxin genes play distinct roles in response to stress conditions in yeast. See Grant, Abstract at page 33. The teaching that GRX1 and GRX2 are themselves stress regulated in yeast does not constitute a disclosure, nor does it necessarily suggest, that overexpressing GRX1 and/or GRX2 would produce enhanced stress resistance in a transgenic plant.

Samuelson is relied upon for teaching that yeast genes can produce an expected phenotype when expressed in plants. Official Action, page 5. In response, Samuelson discloses expression of two yeast Fe(lll) reductases - FRE1 and FRE2 - in Nicotiana tabacum. Samuelson went on to analyze the effect of a simple Fe(lll) reductase transformation on the Fe(lll) reduction in plants and the Fe concentration in leaves. It was shown that, if a foreign Fe(lll) reductase is introduced into tobacco, then Fe(lll) reduction is enhanced (a direct effect). What is shown by the present invention is more complex, i.e. that the introduction of a Glutaredoxin /glutathione-dependent oxidoreductase from yeast into plants leads to an enhanced environmental / oxidative stress tolerance associated with salinity, drought, and/or low temperature. This means that, not only is there a direct effect upon the Grx-reaction, but upon a complex behavior of a whole plant towards environmental / oxidative stress. That plant behavioral pattern would not have been predictable from the results of the single step as assessed by Samuelson.[1]

Moreover, Applicants point out that certain passages in Samuelson teach away from the invention, or at least teach against a clear expectation of success. For example the authors noted that in some cases roots did not show a higher Fe(lll) reduction as it was expected (page 54, left

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[1] The statement in the Official Action that Samuelson teach that "yeast genes can be successfully expressed in plants to obtain expected phenotype" is an over-generalization. An obviousness analysis is fact-based, and a conclusion of obviousness must be based on facts and not generalities. *In re Freed*, 165 USPQ 570, 571 (CCPA 1970).

column). Furthermore, when figures 4, 6 and 7 are analyzed, the skilled artisan would question whether these results are significant enough to permit a scientific conclusion: in figure 6, for example, the difference between leaves 1-4 from the wild-type does not differ significantly from leaves 1-4 from the transgenic plants when the standard deviation is applied. The authors also discuss on page 55, right column, first paragraph, that the control plants showed a higher Fe(III) reduction than the transgenic plants. As indicated in the abstract, plants transformed with a single gene (FREI) do not differ from control plants (next to last sentence).

From the cited references, the Examiner concludes that it would have been obvious to overexpress the nucleic acid taught by Gan in a plant cell with an expectation of regenerating a stress-resistant transgenic plant. Official Action, page 6.

Addressing Lanahan together with Gan, as proposed on page 6, paragraphs 2-3 of the Official Action, neither reference discloses plants with enhanced stress-related traits. There would have been no motivation to combine these references seeking to obtain a plant with the desired traits. The mere fact that a gene can be introduced into plants (with no suggestion to achieve a particular phenotype) does not contribute to the problem of providing a plant with such phenotype (enhancement of stress-related traits).

Considering Grant with Gan, as proposed on page 6, paragraphs 4-5 of the Official Action, Grant et at only show that the expression of the genes GRX1 and GRX2 is altered when yeast is treated with stress, but not vice versa. Therefore, the record does not support a finding that a skilled artisan would find a teaching that the expression of GRXI/GRX2 leads to an enhanced stress resistance (as opposed to, for example, some pleiotropic effect which lead to the altered expression levels). The only information which is provided by Grant is that the GRXI/GRX2 expression is induced in response to various stress conditions, which does not support the very different factual finding that the overexpression of either gene would be sufficient to confer enhanced stress resistance. Since this factual finding is central to the rejection, Applicants submit that the rejection cannot be sustained.

Grant's experiments do not establish that GRX1/GRX2 protect a cell against environmental stresses, but only that GRX1/ GRX2 are stress-regulated. The reference does not

permit a valid conclusion that GRX1/GRX2 protect yeast against stress, let alone that a plant would be protected against stress.[2]

Protection against stress could not have been predicted by Lanahan taken with Gan in view of Grant, and an over-generalization concerning expression of yeast genes in plants based on Samuelson does not rectify this basic flaw in the reasoning offered in support of the rejection.

The separate rejection of claims 11 and 15 further citing Stomp is based on the same rationale as the rejection discussed above and should be withdrawn for the same reasons.

Accordingly, Applicants submit that the finding of obviousness can only result from the hindsight afforded by reading the present disclosure, and cannot be properly based on a fair reading of the prior art alone.

CONCLUSION

For at least the above reasons, Applicants respectfully request withdrawal of the rejections, and indication that the application is allowable but for the double patenting rejection. If any outstanding issues remain, the Examiner is invited to telephone the undersigned at the number given below.

This response is filed within the three-month period for response from the mailing of the Office Communication, to and including October 20, 2008, pursuant to 37 CFR § 1.7(a). No fee is believed due. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 13311-00012-US from which the undersigned is authorized to draw.

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[2] Grant uses methodology different from what would be applicable to plants. Grant measures yeast cells in liquid medium culture after addition of peroxides, superoxide, heat shock, osmotic shock and osmotic stress (page 36, left column, last paragraph and figure 2). Using yeasts, the reported findings are strongly dependent on the cell cycle of yeasts (see e.g. figure 1) which suggests against reaching any conclusions applicable generally to plants.

Applicants also point out that Grant suggests the involvement of Grx1 with repair and not with stress-resistance, and that a Grx1 mutant is unaffected in resistance. See Page 40, right column, bottom.

Respectfully submitted,

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